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fort must be made to establish scientific fundamentals for new investigations. Efforts must be made to find the causes of immunity, and after solving this question to determine without infection the disease-resistant qualities in different varieties and individuals in order to be able to establish the desired resistance and at the same time eliminate undesirable qualities. It is only by working along this line that the breeding of disease-resistant varieties on a scientific basis can be accomplished and results which lie within the limits of possibility obtained.

OTTO APPEL

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THE CAVERN OF THE THREE BROTHERS
(ARIEGE)

For the third time in less than three years it has been the good fortune of Count Begouen of Toulouse to announce the discovery of important works of art left by paleolithic man on the walls and floor of Pyrenean caverns. His two previous discoveries were noted at the time in the columns of *SCIENCE*.¹

Quaternary art objects may be classed under two heads: the portable and the stationary. The portable class includes in part carved tools, weapons and ceremonial objects, such as poniards, spear throwers, bâtons, etc. It also includes engraved pebbles as well as carved fragments of stone, bone, ivory and the horn of stag and reindeer; in fact, almost anything that could be seized upon to satisfy the exuberant demands of the cave man's artistic impulse.

Stationary art embellishes the walls and ceilings of caverns and rock shelters. In rare instances the fine clay of the cavern floor was utilized for sketching and modeling purposes. The scientific world has been more or less familiar with the portable class of troglodyte art for more than half a century. Our acquaintance with the stationary art is of more re-

cent date. The first discovery of this kind was made by Sautuola in 1879 at the cavern of Altamira in northern Spain. The scientific world, however, did not grasp the real significance of Sautuola's discovery until, after the lapse of nearly twenty years, similar finds had been made in France.

All three of Count Begouen's discoveries have to do principally with cave art of the stationary kind. In July, 1912, near his country estate of "Les Espas," which is only a short distance from Saint-Girons (Ariège), he found a series of subterranean galleries and connecting corridors opening out of an underground stream bed. On the walls of one of the corridors were several engravings of the horse, reindeer, mammoth, etc. Five days later it was the privilege of the writer to see this prehistoric gallery, called Tuc d'Audoubert, in company with Count Begouen and his three sons.

In October of the same year Count Begouen and his sons succeeded in gaining entrance to an additional gallery of the series, but not until after they had broken down two stalagmite pillars that blocked the narrow passage way. What they found there has already been described. The most notable objects were two figures of the bison modeled in the clay of the cavern floor. They owed their preservation to the accidental sealing up of the gallery ages ago by the stalagmite pillars. In view of their excellence, it is probable that they are not unique examples; that perhaps other similar figures less fortunately situated have been destroyed because the artist did not know how to temper and fire his product.

The need of something less difficult to manipulate than stone, bone, ivory and horn must have been ever present in the experience of the troglodyte artist; it is not strange therefore that he should have finally hit upon clay. This illustrates how near an individual or a race may come to some great discovery and yet fall short of it. Thus was the discovery of the ceramic art left to the later more practical, if less artistic, neolithic races.

The latest discovery of Count Begouen and

¹ N. S., XXXVI., pp. 269 and 796, 1912.

his sons, announced recently in a note read at the French Institute, the substance of which is contained in a letter just received from him, was made only a few days before the declaration of war last August. In fact, it was on July 20, 1914, exactly two years after the discovery of Tuc d'Audoubert, that he and his three sons descended by an opening until then unknown into a superb cavern, which in their honor he has named *Caverne des Trois Frères*. It is about half way between Tuc d'Audoubert and the cave of Anlène, in other words about a quarter of a mile from each. Count Begouen believes that the three caverns are connected by corridors; proofs of a connection between two are already in hand.

The exploration was not only difficult, but also dangerous (there are galleries into which he has not yet been able to penetrate), but one is well paid for the effort because of the beauty and elevation of the ceilings as well as "the numerous prehistoric remains encountered there." On the floor were many bones, flint implements and objects bearing man's handiwork.

The results of their first visits were of such a nature as to foretell an abundant harvest when the work shall have been resumed. Upon a bone fragment there was an excellent engraving of a fish. But the chief display of art was on the walls, especially of the terminal gallery, where more than two hundred admirably engraved figures of animals are to be seen. The following species have already been identified: Mammoth, rhinoceros (the first found in the caverns of the Pyrenees), bear, lion, wolf, deer, reindeer, wild goat, horse, bison, chamois, eel and bird. There are also anthropomorphic figures including a curious female type drawn in black; it seems to be walking almost on all fours with the head surmounted by a reindeer horn. It might represent a human figure wearing a mask, or perhaps a figure with mixed attributes; if the latter, then we have a new note in paleolithic art, for until now that art has revealed no representations of mythologic creatures.

Most of the mural art in the *Caverne des*

Trois Frères is admirably done; a small panel with reindeer at rest evidently enjoying themselves is "like a page from an album." From the viewpoint of the engravings this cavern is "certainly the richest and the most beautiful thus far known." In addition to the animal and anthropomorphic figures, Count Begouen noted lines, spots of red or black, and red claviform signs, presumably representing clubs.

War was declared before excavations could be begun. With two of the "trois frères" at the front since then and the youngest having recently joined them there, it can readily be understood why Count Begouen does not wish to return to the cavern so aptly named until he can do so accompanied by his three boys after the war is over. Let us hope that he may have to wait neither long nor in vain.

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SOME EARTHQUAKE PHENOMENA NOTED IN PANAMA

IN October, 1913, the writer was asked by President Porras of Panama to undertake some investigation into the causes of the earthquakes which, during that month, were felt almost daily in the Azuero peninsula which forms the south central part of the republic.

In the course of this investigation two well-recognized geological principles took on a new and impressive significance for the writer, and a vividness that he had never before been able to clothe them with. These principles are the relation of faulting and fracture to earthquakes, and the elasticity of the earth as expressed in earth-waves.

Simultaneously with the first and heaviest shock the cable line from Panama up the west coast to California broke at a point where it passes over the submarine escarpment from the continental shelf at about 60 fathoms to the ocean depths at from 700 to 1,000 fathoms. The distance on the chart from the 60-fathom sounding to the 784-fathom sounding is less than two miles. It is not known, however, whether the slope between these two points is